## REMARKS

Claims 1 and 7 have been amended. Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "Version with markings to show changes made." Claim 3 has been cancelled. Accordingly, claims 1-2, 4-5, and 7-8 are pending.

The drawings are objected to due to formalities regarding underlining of reference numerals (Figs. 1A, 2, 5, and 6A) and lead lines (Figs. 1B and 9A). Concurrently submitted with this response is a proposed drawing correction to Figs. 1A, 1B, 2, 5, 6A, and 9A. Accordingly, the Examiner is requested to approve the proposed drawing correction and withdraw the objections to the drawings.

Claims 1-5 and 7-8 stand rejected under 35 U.S.C. § 112, first paragraph, as allegedly containing subject matter which was not described in the specification. More particularly, the Office Action points out that page 7 of the specification describes that a mechanical sensor may be used to detect the presence or absence of tape bur, but is silent as to the precise type(s) of mechanical sensor would be capable of such a function, and that the description is unclear.

This rejection is respectfully traversed. The relevant portion of the specification under discussion appears at pages 6-7 and is reproduced below for easy reference:

> The tape cutter 401' according to the present invention is shown in Fig. 7A (top view) and 7B (side view). The tape cutter 401' is similar to the prior art tape cutter 401, but includes a sensor 420 which is coupled to a circuit 430. In the exemplary embodiment, the sensor 420 is a mechanical sensor which is placed behind the cutting element 410 relative to the direction A of cutting at a predetermined short distance (e.g., 0.5 mm) from the perimeter of the wafer 100. The short distance is chosen based on how much tape can protrude from the perimeter of the wafer 100 without increasing the risk of improper wafer backgrinding due to a tape bur. Thus, the sensor 420 may be placed at varying distances from the perimeter based upon, for example, the thickness or the stiffness of the protective tape 320. Alternatively, the sensor 420 may be any other type of sensor capable of differentiating

> between the presence and absence of the protective tape. For example, the sensor could be an optical sensor.
>
> The sensor 420, which is coupled to a circuit 430 and which is provided behind the cutting element 410 relative to the direction A of cutting, is used to determine whether the cutting element 410 properly and completely removed the tape bur 325 during a tape cutting operation. If the sensor 420 detects a tape bur 325 after the cutting operation, the circuit 430 causes the tape cutter 401' to take corrective action. The corrective action can be any action which prevents the wafer 100 with tape bur 325 from being processed by the backgrinder 402. In the exemplary embodiment, the circuit 430 halts the tape cutter 401' and prevents automated movement of the wafer 100 to the backgrinder 402. Alternatively, the tape cutter 401' could be triggered by sensor 420 and associated circuit 430 to route improperly trimmed wafers 100 to an alternate location (e.g., a reprocessing area). It is also possible to stop operation of the backgrinder 402 by a signal from circuit 430 when the backgrinder 402 receives a wafer containing a tape bur 325.

As evident in the above reproduced descriptions and from Figs. 7A and 7B, the sensor 420 is preferably oriented behind the cutting element (relative to the cutting direction) at a predetermined distance (0.5 mm in one preferred embodiment) from the periphery of the wafer. The sensor is intended to detect whether the cutting element had indeed removed the tape. It is respectfully submitted at an artisan working in this field would be aware of many types of mechanical (and optical) sensors capable of sensing the presence or absent of tape from the above-described location of the sensor. For example, a simple mechanical sensor having a lever which would be deflected if tape bur were not properly cut would be a suitable mechanical sensor. Likewise, an optical sensor which has a light beam interrupted by the presence of a tape bur is yet another example. Indeed, such sensors are well known. For example, the Kira reference cited in the Office Action discloses using a photodetector 110 as an optical sensor at column 10, lines 51-56. Accordingly, the rejection to claims 1-5 and 7-8 under 35 U.S.C. § 112, first paragraph, should be withdrawn.

Claims 1-5 and 7-8 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite due to issues regarding antecedent basis with respect to the terms "a wafer," in claim 1 and "the edge", in claim 7. Claims 1 and 7 have been amended to

include proper antecedent basis. Accordingly, the rejection to claims 1-5 and 7-8 under 35 U.S.C. § 112, second paragraph should be withdrawn.

Claims 1-5 and 8 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Kira (published European Application EP 0 307 509 B1). Claim 7 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Kita. These rejections are respectfully traversed.

The present invention is directed to a wafer backgrinding apparatus which includes an intelligent cutting/routing apparatus. One of the steps in integrated circuit production is a backgrinding process where a silicon wafer's thickness is reduced. Typically, a wafer to be backgrinded has an adhesive tape attached to the front side of the wafer. The tape provides additional structural stability to help prevent wafer breakage during the backgrinding process. Once the adhesive tape has been attached to the wafer, excess adhesive tape protruding from the perimeter of the wafer must be removed in a cutting process. If the cutting process is not properly performed, excess tape, known as tape bur, may be attached to the wafer. If the wafer is then fed to the backgrinder, the excess tape may become folded between the wafer and a portion of the backgrinder as illustrated in Fig. 4 of the application. Tape bur can diminish the structural stability of the wafer during backgrinding and result in wafer breakage.

In the present invention, an intelligent cutter/router apparatus is used to detect whether the cutting operation has been properly performed. A sensor is located behind the cutting tool at a predetermined location and can sense whether tape bur is present. If tape bur is not detected, the tape has been properly cut and the wafer is routed to the backgrinder by a transport. If tape bur is detected, a circuit initiated corrective action by preventing the transport from routing the wafer to the backgrinder. In this manner, wafer breakage is avoided by ensuring that the backgrinder does not operate on wafers which include tape bur. Accordingly, claim 1 recites: "a sensor for detecting if the portion of the protective tape on a wafer is properly removed by said cutting element; a transport mechanism for moving the wafer from support to a grinding apparatus if the portion of the

protective tape on the wafer is properly removed; and a circuit for initiating corrective action to stop the transport mechanism from moving the wafer to the grinding apparatus when the sensor detects that a protective tape is not properly removed from a wafer by said cutting element."

Kira discloses an apparatus for removing a thin article from an input stack of thin articles, applying adhesive tape to said removed thin article, trimming said applied adhesive tape, and stacking said removed, taped, and trimmed thin article upon an output stack. Although the apparatus of Kira is capable of being used with wafers, Kira fails to disclose routing processed wafers to a backgrinder. Kira discloses at column 10, lines 51-56 that it is capable of detecting uncut tape bur and can respond by halting the cutting process. However Kira does not further disclose nor suggest taking additional corrective steps, such as preventing articles do not have properly trimmed tape from being routed to the output stack. Kira therefore fails to teach or suggest "a sensor for detecting if the portion of the protective tape on a wafer is properly removed by said cutting element; a transport mechanism for moving the wafer from support to a grinding apparatus if the portion of the protective tape on the wafer is properly removed; and a circuit for initiating corrective action to stop the transport mechanism from moving the wafer to the grinding apparatus when the sensor detects that the protective tape is not properly removed from a wafer by said cutting element."

As such, claim 1 is believed to be allowable over the prior art of record. Depending claims 2, 4-5, and 7-8 are also believed to be allowable.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

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Respectfully submitted,

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**Version With Markings to Show Changes Made**

**IN THE CLAIMS**

Please amend claims 1 and 7 as follows:

1. An cutting apparatus [for removing a portion of a protective tape from a wafer,] comprising:

a support for holding a wafer having a protective tape thereon;

a cutting element placed at a first predetermined distance from said support for moving relative to said support to cut a portion of the protective tape from the [a] wafer when the wafer is placed on the support;

a sensor for detecting if the portion of the protective tape on a wafer is properly removed by said cutting element; [and]

a transport mechanism for moving the wafer from support to a grinding apparatus if the portion of the protective tape on the wafer is properly removed; and

a circuit for initiating corrective action to stop the transport mechanism from moving the wafer to the grinding apparatus when the sensor detects that [a] the protective tape is not properly removed from a wafer by said cutting element.

7. The apparatus of claim 1, wherein said first predetermined distance is approximately 0.5 mm from the edge of the [a] wafer when the wafer is placed on said support.